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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Chin Strap Assembly for a Helmet.

I, LEONARD PETER FRIEDER, a citizen of the United States of America, of 145 Station Road, Kings Point, Great Neck, Long Island, State of New York, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a protective helmet and more especially to a chin strap assembly including at least one break link portion.

One of the problems with protective helmets and head coverings for resisting impacts to the head is related to the requirement that they must be retained upon the head of the wearer under conditions of impact and various other stresses in order to be effective to give the desired head protection. For this purpose, straps are provided to embrace the lower extremities of the head of the wearer for the purpose of retaining the helmet in place upon the wearer's head. However, there are occasions when the head covering is subjected to extreme momentary stress in a rotational direction tending to rotate the shell of the head covering about the head of the wearer, or the stress may be in a direction to displace the shell away from the head of the wearer. In either case, the resultant stress transmitted to the lower extremities of the head of the wearer by means of the straps may be of a truly dangerous magnitude. The source of such a stress may be derived from an accidental impact or collision of a vehicle in which the wearer of the protective head covering is an occupant, or if the wearer of the head covering is a police officer who is helping to control a riot, for instance, such sudden impacts or stresses may result from hand to hand physical engagement with rioters. No matter what the source of the stress, if the stress is sufficiently great, the possible risk of injury from the stress transmitted through the strap to the head of the wearer is very serious.

Accordingly, it is an object of this invention to provide an improved protective head covering with retaining means surrounding the lower extremities of the head of the wearer which are sufficient to maintain the covering upon the head of the wearer under all normal stress conditions, but which are releasable under abnormal stress conditions in order to avoid injury to the wearer.

The embodiment of the helmet illustrated comprises a rigid shell made of suitable material which may be of known composition, for example one utilizing a plastic binder, which is capable of being molded to shape as a hollow shell open at the lower side thereof for receiving the head of the wearer, the opening being defined by the edge of the shell extending about the head generally horizontally. The structure may provide for suspending by flexible suspending means sound attenuating means in positions to engage the ears of the wearer. The suspending means is secured to the side wall of the shell, preferably adjacent a bay formed in the edge portion of the shell which extends about the head receiving opening thereof, so that a sound attenuating means which may be in the form of an ear cup of substantial size may be disposed in position to cover the ear of the wearer without engaging the shell. The suspending means, moreover, includes a flexible element, preferably elastic, to provide for stretching and contraction thereof generally in the direction between the shell and the ear cup, this flexible element at its lower end engaging an

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endless cord extending about a hollow member and over the outer surface thereof, this hollow member providing the main body of the ear cup. The flexible element may be of such form as to loop about the endless cord so as to slip along the length of this cord to different positions in relation thereto.

Means are also provided for restraining the ear cups against forward movement thereof. This means may include a nape strap connected between the two hollow members serving as ear cups which are disposed at opposite sides of the head and engaging the cords carried by the hollow members at the respective sides. Adjustment of the length of this strap by means of a buckle serves to hold the ear cups in relation to the head against forward movement when the strap extends across the back of the neck.

Further, a chin strap may extend between and may be connected as by snap fasteners to a pair of loops respectively engaging the cords of the hollow members at the sides of the head. This chin strap may carry a buckle for adjustment and may be provided with a chin cup for engaging the chin of the wearer.

In carrying out the invention, a strap is employed which has at least one break link which remains intact under normal stress conditions, but which is capable of breaking at a predetermined limit of abnormal stress which is generally less than that which will cause serious injury to the wearer.

The cord engaging loops which cooperate with the nape and chin straps ordinarily may be non-elastic since they are readily adjustable by means of the buckles referred to. These straps and the loops cooperating therewith, however, may be made of elastic material if desired.

In the helmet illustrated a telephone instrument is supported within the hollow member by a resilient sound absorbing material, such as foam rubber or plastics, this supporting material being formed to fit to the inner surface of the hollow member.

Means also may be provided which in addition to serving as a nape strap for the purpose above mentioned may comprise a fabric member which engages the cords that extend about the hollow members to provide for the slipping adjustment of the loops as described. This fabric member may carry means for attachment of an oxygen mask disposed on the face of and covering the nose and mouth of the wearer and held in place by the fabric member and the nape strap portion thereof engaging the back of the neck.

Construction and support of the visor of the helmet and of detent means therefore are provided for movement of the visor between eye shielding and retracted positions and for holding the visor in desired positions.

In accordance with the present invention there is provided a chin strap assembly for a helmet including at least one break link portion comprising a folded portion having stitches holding said folded portion together against unfolding, said stitches collectively having less tensile strength than the other portions of said strap assembly.

In order that the invention may be understood, it will be described with reference to the accompanying drawings, in which:—

Fig. 1 shows in perspective a helmet of the invention and the parts supported thereby mounted in position on the head of the wearer, the visor thereof being raised to retracted position;

Fig. 2 shows a front elevation of the helmet;

Fig. 3 is an edge view of an improved chin strap structure in accordance with the present invention;

Fig. 4 is a detail view showing a break link portion of the strap structure of Fig. 3 under stress.

In Fig. 1 is shown a helmet 20 having a rigid shell 21 of suitable material and having an opening at the lower side thereof for receiving the head of the wearer and defined by edge 23 disposed at a level somewhat above the eyes and the nape of the neck. The shell is supported in this position on the head by rigging and headband means and carries a visor 25 supported on track means 27.

The shell also supports a pair of ear cups 29, as shown in Figs. 1 and 2, suspended by means 30 secured thereto and secured to the shell by screws 31. The edge 23 of the shell extends about a bay 33 formed in the shell to accommodate the ear cups 29. The ear cups 29 are angularly adjustable with respect to the suspension means generally in planes parallel to the ears so as to fit suitably to the ears of the wearer. A strap 35 connects the two ear cups and extends across the nape of the neck. Connecting also to the two ear cups 29 is a chin strap 37 carrying a chin cup 39 engaging the chin of the wearer. The chin strap is omitted in Fig. 2 but loops 41 are shown in Figs. 1 and 2 for removably connecting the chin strap thereto.

In order to hold the ear cup 29 in the adjusted position with respect to the ear, the chin strap 37 above mentioned may be adjusted by adjusting the end portion 81 engaging a buckle 83 connected to a fabric element 85 which carries a snap fastener 87 engageable with the cooperating fastener 89, Fig. 2 secured to the loop 41 above mentioned. The loop 41 engages and is held in assembled relationship with the ear cup 29 by means of a cord 73, Fig. 2, which surrounds cup 29 in a peripheral channel therein. Loop 41 may be moved along the cord 73 while being held in frictional relation

thereto, or the ear cup may be rotated with corresponding movement of the cord 73 and the loop 41. At the opposite side of the head from that shown in Fig. 1, a similar cord engaging loop 41 is disposed, Fig. 2 carrying snap fastener 89, a cooperating fastener 87, not shown, being provided at that end of the strap 37.

By adjusting the buckle 83, a certain amount of pull may be brought upon the ear cup against the bias of the loops 30. This tension serves to hold the ear cups in the desired position in the generally vertical direction as well as to draw the ear cups toward the ear.

The strap 35 which extends across the nape of the neck, as above mentioned, also is provided similarly with a buckle 91 through which the end 93 of the strap 35 is passed for adjustment, this buckle also being carried by a loop 95 which engages the cord 73 in the same manner as the loop 41 for sliding movement relative to the cord. The opposite end of the strap 35 may be directly looped about the cord 73 of the ear cup at this opposite side of the head. It will be understood that the pull of the straps 35 and 37 may have a resultant directed generally downward in Fig. 1 against the elastic bias of the loops 30, so that the ear cups are held by these opposed tensions in the desired relation to the ears.

As shown in Fig. 1 the chin cup 39 is provided with slots 105 disposed at the respective ends of the chin cup at either side of the chin. The strap 37 which extends between the loops 41 passes through these slots and over the outer surface of the chin cup, which is of generally outwardly convex, form, so as to hold the chin cup 39 against the chin. The chin cup also is provided with a lining 107 which may be made of soft leather for engagement with the chin of the wearer, this lining extending over the edge of the cup. For ventilation, the rigid shell 39 of the chin cup may be provided with perforations 109 extending through the wall thereof but not through the leather lining. These perforations serve to ventilate the leather lining to provide for the evaporation of moisture which may be absorbed by the leather from the chin. The perforations may be disposed in the portions of the chin cup at either side of the strap 37 or may extend in distributed relation over a greater part of the chin cup including the part beneath the chin strap 37. It will be understood, because of the arrangement described, that the chin cup may be slipped along the chin strap 37 in order to adjust it comfortably to the chin of the wearer. The chin cup 39 may be made of a plastic material molded to rigid form. Instead of the leather lining of the chin cup other materials which are suitable for absorption of perspiration and for comfortable engagement with the chin may be utilized.

The chin strap 37 and nape strap 35 also may be made of elastic material if desired but preferably are of strong tapes without substantial elastic extensibility in order that, when the buckles are adjusted, the parts supported by these straps will remain adjusted to the head and chin of the wearer of the helmet. Quick connection or disconnection, therefore, may be effected by snapping or unsnapping the snap fasteners 87 with respect to the corresponding fastener 39 with assurance that the parts will remain in position for fitting the head, ears and chin of the wearer.

The buckles 83 and 91 may be provided with lifting tabs 140 which easily may be pulled away from the straps 37, 35 for quick release of the buckles from the strap, when desired, to cause the buckle to move along the strap. Pull upon the end of the strap will effect tightening of the strap and with the buckle released from the hand, gripping engagement of the strap by the buckle again will take place.

Figure 3 is an edge view of a modified chin strap 37a which incorporates the break link feature for the protection of the wearer of the head covering from undue stresses imparted from the strap to the wearer. All of the parts and components of the strap 37a of Fig. 3 and components associated therewith, which have counterparts in the structure shown in Figure 1 are numbered similarly to the corresponding parts of Figure 1. Wherever there is a structural difference in the embodiment of Figure 3, the part having that structural difference is numbered with an added subscript "a".

In this embodiment of the chin strap, the end portion 85a shown at the top of the figure is connected to the buckle 83 by means of a loop 141 which is closed at 143 by bartack stitching 145. As shown in the drawing, the body of the strap is doubled upon itself at bartack stitching 145. With this construction, and with bartack stitching which is carefully applied over a given length of stitch with a predetermined stitch density, it is possible to obtain a breaking action at the bartack stitching 145 within rather narrow limits of tension stress upon the strap. For instance, it is possible to provide a breaking strength at 125 lbs. of tension stress within a range of plus or minus 25 lbs. This is achievable with ordinary manufacturing procedures, and without serious practical difficulty. Generally, the row of bartack stitching does not extend quite to the side edges of the strap because this makes the breaking point stress of the bartack stitching and the associated connection much more predictable.

The precise breaking point stress of the

break link which is to be provided with a particular protective head covering structure is largely a matter of design choice. Essentially any break point requirement can be provided and maintained within tolerances similar to that stated above for a strap having a breaking strength of 125 lbs. The actual nominal breaking strength selected will depend largely upon the design of the head covering, the means of fastening the retaining strap to the head covering, and various other factors which may include the size and physical strength of the wearer, etc. In general, however, it can be stated that the strength of the retaining strap and the break point stress of the break link must be greater than the normal stresses to be encountered by the retaining strap, but must be less than the abnormal stresses which are of a magnitude sufficient to cause injury to the wearer.

At the other end of the strap 37a, there may be provided another break link at 147 which is also fastened by bartack stitching at 149. At the break link joint 147, two separable ends of straps are joined in an arrangement in which each strap end has a single fold to form a hook-like configuration which engages with the hook of the other strap end, and the four strap thicknesses are attached together by the bartack stitching 149. This variation of the break link structure also serves efficiently as a structure having a predictable stress break point.

Either of the break links at 143 or 147 provides for a complete separation of the strap at the link when the break point stress is achieved. Each includes a discontinuity in the strap body structure, with the ends of the strap body at the discontinuity being joined by the sewing at the break link. Therefore, a single break link at either location in the strap is sufficient for accomplishing the objectives of the break link feature. However, it is preferred that both break links at 143 and 147 should be included, since together they provide more complete protection. Furthermore, when the unusually high stresses are encountered, they can be localized to a degree on one side because of the engagement of the strap across the lower extremities of the head of the wearer. This is particularly true of the chin strap 37a because of the operation of the chin cup 39. Therefore, it is logical to have break link protection on each side. Furthermore, with two breakable links, wider break point stress tolerance limits are acceptable because of the improbability that the break points of both links will be at the high end.

It is characteristic of both of the break links at 143 and 147 that when extreme tension is applied to the strap, the bartack stitching 145 and 149 is subjected to a rather direct tension stress. This provides a more clearly predictable breaking action at the stitching. This is exemplified for link at 147 by the detail shown in Fig. 4.

Figure 4 is a detail view showing the break link at 147 and the associated portions of the strap 37a as it appears when under a severe stress condition approaching the breaking point stress magnitude. This view clearly illustrates that the bartack stitching 149 is substantially in tension when the strap is stressed in this manner. Furthermore, while not clearly shown in Figure 4, since the bartack stitching 149 does not extend all the way to the side edges of the strap, the edges of the strap have a tendency to pull away from one another and to place the ends of the bartack stitching under the greatest localized stress. This feature of the structure also contributes to the predictability of the break point stress limit of the break link structure.

The predictability of the break point stress limit is basically provided by the features of construction of the break links as described above. Employing these features of construction, there are many possible variations in thread sizes, thread materials, the type of stitching to be used, the number of stitches to the inch, and the length of the line of stitching which may be employed in order to obtain a predictable result. However, in order to exemplify this invention and to provide a complete teaching of the manner in which this invention may be carried out, a specific example of a break link structure in accordance with the teachings of this invention is as follows:

With standard bartack stitching, a thread material of Silk-Finish Cotton having a thread size of 30/3, and with 61 stitches to the inch, and an effective stitched length of of 150 lbs. plus or minus 25 lbs. Working 11.16 inch provides a break point stress limit from the above example as a point of departure, variations in the stitching of the break link provide predictable break point stresses.

WHAT I CLAIM IS:—

1. A chin strap assembly for a helmet including at least one break link portion comprising a folded portion having stitches holding said folded portion together against unfolding, said stitches collectively having less tensile strength than the other portions of said strap assembly.

2. A chin strap assembly according to claim 1, wherein a chin-receiving member is provided having an inner surface of a soft, moisture-permeable and air-permeable material; and means connect said chin-receiving member to said helmet for lateral adjustment therebetween comprising strap guiding means near each lateral extreme of said chin-receiving member, a strap is engaged by said strap guiding means so as to contact said

chin-receiving member across the convex surface thereof, and means connect opposed ends of said strap to respective lateral portions of said helmet, including the break link portion.

3. A chin strap assembly according to claim 2, wherein the break link portion is located in the strap.

4. A chin strap assembly according to claim 2 or 3, wherein the stitching through the folded portion is held against unfolding thereof under tension, said stitching having less tensile strength than the strap.

5. A chin strap assembly according to claim 2, 3 or 4, wherein the strap comprises at least one loose strap end captured by the stitching at the folded portion so that rupture of said stitching completely disconnects one end of the chin-receiving member from the helmet.

6. A chin strap assembly according to claim 2, 3 or 4, wherein the strap comprises two overlapping strap ends captured by the stitching into the folded portion so that rupture of said stitching completely disconnects one end of the chin-receiving member from the helmet.

7. A chin strap assembly substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1.

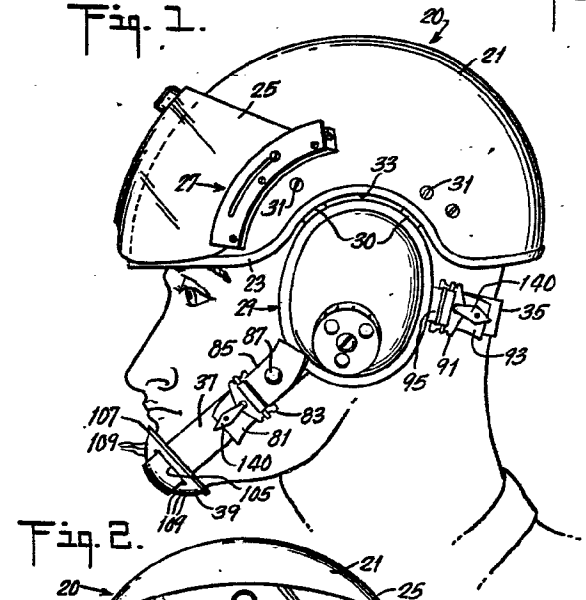

Fig. 2.

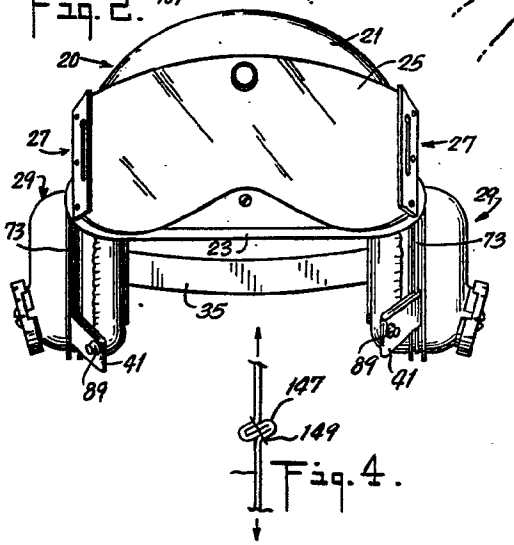

Fig. 3.

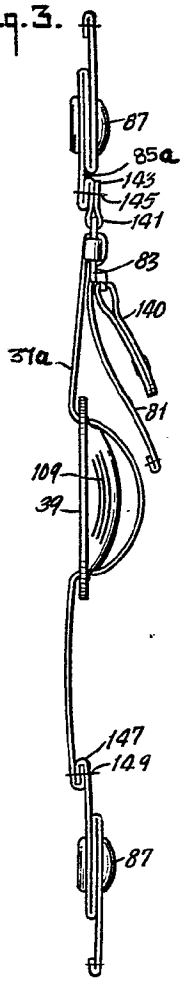

Fig. 4.